

TUBERCULOSIS OF THE SACRO-ILIAC JOINT.

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HISTORY.—If we may judge from the literature which we have inherited, the existence of sacro-iliac tuberculosis was unknown prior to the present century. True, the ancient and mediæval leeches from Hippocrates to Ambroise Paré found delight in the study of the condition of the pelvic symphyses during pregnancy and parturition. And Louis records some traumatic lesions of the sacro-iliac joint occurring in the practice of Philippe de Chartres; while L'Heritier had a case which Delens thinks was probably one of preternatural mobility of that articulation compensatory to ankylosis of the hip-joint.

But it is not until we reach Boyer that we really find an account of the disease in hand. In 1821 Boyer described sacro-iliac disease as a chronic affection of the sacro-iliac joint, distinctly indicating his opinion that the disease was of scrofulous origin, and that it was pathologically similar to "spontaneous luxation" of the hip-joint.

Attention having been called to the possibility of disease at this location, Velpeau three years later drew attention to suppuration there during the puerperium, and considered the sacro-iliac joint as the point of origin of other suppurations found at autopsies. In later years Velpeau described in his clinics cases of true sacro-iliac disease distinguished clearly from puerperal metastatic infection. One of his internes wrote a monograph upon this subject a few years later.

Larrey described the affection briefly under the term sacro-coxalgie, which he was the first to use. He compares it with tumor albus of other joints.

In 1833 Langier published an article in the *Dictionnaire Medicale* which has been much read; and in the same year

Hahn published in German an important monograph which was quite a complete résumé of the subject.

Sacro-iliac disease has been a favorite topic for theses of the Faculty of Paris, among which are those of Frère (1838), Girauld de Nolhac (1840) and Delineau (1842), who, inspired by the lectures of Larrey, made an important contribution. Then come the names of Joyeux (1842), Maisonneuve, who (1844) detailed the chief points in the differential diagnosis between sacro-iliac disease and morbus coxarius; and Nélaton (1847), who gives a résumé of the history of the study, which had hitherto been much neglected.

Gurlt, in 1853, gives many valuable facts in his treatise on joint affections.

But to Erichsen, of England, belongs the credit of having formulated in a lecture published in the *Lancet* (1859, 9, p. 25) a clinical account of the disease, which at that early and important date directed the course of investigation, and clearly fixed many of the chief points in the differential diagnosis.

Three years later Boissarie collected some observations and made a study of the disease, while Velpeau again directed attention to the subject by a lecture.

Lectures by Gosselin and Broca in 1868 contributed to the elucidation of the diagnosis of the disease, while in the same year Duplay gave in his *Traité de Pathologie* a complete study of the subject.

Holmes' "System of Surgery," 1870, contains an excellent article by A. Johnstone on acute and chronic sacro-iliac disease.

In 1873 the theses of the Faculty of Paris again afford a paper on this subject by Delens, who has presented a monograph which is a model of scrupulous care in the collection of material, and of almost judicial firmness in the exclusion of irrelevant or imperfectly substantiated evidence. With such scientific conscientiousness has the work been done that I can only criticise the facts that the work of foreign writers has not been completely presented, and that some cases of disease of the sacro-iliac joint due to infection by other microbes than that of tuberculosis, although clearly diagnosticated, have been given a place, not only in the list of cases, but are even intro-

duced to illustrate the symptomatology and diagnosis of the disease.

In 1875, A. Bounaix presented to the Faculty of Paris a thesis on the same subject, describing four instructive cases of the disease, three of which were examined *post-mortem*.

In the following year, Heath published in English an account of several cases more or less complete, chiefly with a view to illustrate a special method of treatment.

Poore, in 1878, published in the *American Journal of Medical Sciences* a review of the subject from a clinical point of view, followed by a collection of literary references. The chief bulk of this paper is taken up with the analysis of 58 cases which he has collected. It is, however, unfortunate that the writer has not given specific reference to each case in order that later students might examine them with the added knowledge of recent pathology and of modern surgical treatment. Especially is this true since the writer has introduced numerous examples of gonorrheal as well as primary and secondary suppurative affections of the joint. His statistics being thus vitiated lose much of their scientific value.

Prof. L. A. Sayre, from the abundance of his experience was able in 1879 to refer in a clinical lecture to eighteen cases of sacro-iliac disease with only one death. Besides the case taken from his Orthopedic Surgery, I am fortunately able, through the courtesy of Prof. Sayre, to present the details of a number of cases which were merely referred to in the clinical lecture. In his orthopedic surgery the same distinguished writer has referred to the disease, and has given an account of the operative interference to which he has resorted in certain cases where abscesses had formed.

In St. Petersburg, G. Tiling published in 1883, in the *Medicinische Wochenschrift* of that city, an account of four cases in two of which operations were made that were intended to be as nearly radical as possible. The article is, therefore, of considerable value, and will be referred to again.

Only last year F. J. Gant reported two cases in which he had performed *évidement* with a successful result.

It will thus be seen that the subject of sacro-iliac disease has not received the same degree of attention that has been

given to tubercular affections of other joints. This is to be accounted for both by the fact that the disease is quite rare, and also that the diagnosis is often so difficult that doubtless many cases have escaped detection.

ANATOMY AND PHYSIOLOGY.—The anatomy of the sacro-iliac joint has been a subject of discussion for many years, apparently because but few anatomists have studied the articulation carefully and minutely, rather than that the joint presents any special features of difficulty in investigation. Its classification has been a matter of embarrassment because of the variation in the point of view from which authors regarded it, some bearing in mind chiefly its mobility, others its cartilages, and still others its means of union. Thus Boyer ranked it, on account of its slight mobility, among the synarthroses. Blandin regarded it as a diarthrosis, while more recently M. Cruveilhier considers it an amphiarthrosis. With this last conclusion, M. Sappey, whose observations vary but slightly from those of Luschka, is in accord. Delens¹ considers this decision a just one because of the clinical resemblance of sacro-iliac disease to Potts' disease of the spinal column.

To discuss anatomical details, Henle's account of the capsule seems to be the most careful and reasonable of the recent descriptions. He says in his *Anatomie des Menschen* :

"The capsule of the ilio-sacral joint is periosteum, tightly stretched over the cleft of the joint, strengthened externally by horizontal fibres and, toward the joint cavity, covered with a soft vascular layer of connective tissue. It extends only upon that part of the joint turned toward the pelvic cavity, not immediately from the border of the cartilaginous layer, but at a slight distance from it, passing along near it from the anterior surface of the sacrum and ilium, so that here a small space remains into which synovia can escape. In this space are to be found low forms of synovial shreds, but they are also seen on the remaining cartilaginous surfaces."

It is thus seen that Henle recognizes a synovial element in the joint, a point not referred to by some of the earlier authors. Luschka, whose work on the "half-joints" (*halb-*

¹De la Sacro-coxalgie, p. 20.

gelenke) has become an honored classic, had already established¹ the fact that a cavity existed here at all ages and in both sexes, and had found in it a small quantity of pale yellow, viscid synovia. The same distinguished anatomist bears witness to the rich vascularity of the synovial membrane and of the fibrous capsule. The fact that the synovial cavity is, as it were, a mere cleft, accounts for its limited capacity.

The thickness of the cartilaginous layers is important in this diminution of the size of the cavity. Luschka states that the cartilage upon the auricular surface of the sacrum may attain a thickness of three millimeters². Henle, who gives the thickness of this cartilage as two or three millimeters, is in practical agreement with Luschka, while Sappey states that its thickness is from one to one and a half millimeters. All are agreed that the cartilage of the ilium is of less thickness than that of the sacrum, Henle stating that it is not over one millimeter in thickness.

Sappey³ remarks that the color of the sacral cartilage is not a dull white like that of the diarthrodial cartilages, but has a whitish or reddish gray appearance. Both Sappey and Luschka aver that the cartilage upon the sacrum is composed of an osteal hyaline layer covered by fibro-cartilage on the synovial side. Luschka alone states that there are two layers upon the ilium. Delens⁴ says, "In reality there is for the sacro-iliac articulation only one fibro-cartilage provided at its centre with a cavity analogous to those of the intervertebral discs. This cavity extends almost up to the limits of the fibro-cartilage (it is that which permits its separation into two halves). It is in other directions of very limited extent."

The only remaining soft tissue properly part of the joint is that of the ligaments, which are most satisfactorily described by Sappey,⁵ who numbers six distinct bands or masses. The ilio-lumbar, which he includes as belonging to this joint, passes

¹Delens, *ibid.*, p. 19.

²Virch. Arch. VII. 2, 1854.

³Quoted by A. Courty, Art. "Bassin", Dict. des Sciences Med

⁴Sacro-Coxalgie, p. 19.

⁵Quoted by Courty, as above.

from the summit of the transverse process of the last lumbar vertebra to the posterior portion of the iliac crest. A superior and an inferior anterior ligament are found passing between the sacrum and the innominate on their iliac and pelvic surfaces. By far larger and more powerful than these are the posterior ligaments, superior and inferior, which together with the inter-osseous ligament, extend from the rough space above the auricular surface of the ilium downward and inward to the depressions on the lateral mass of the sacrum.

The anatomy of the bones entering into the formation of this joint needs no elucidation here. Their relative form and position, however, should not be a matter of misapprehension. To quote from Quain¹, "In the erect posture the sacrum is thrown so much backwards that none of the advantage of the keystone of an arch is obtained by the tapering of its form from base to apex. It is only by the sinuosities of its auricular surfaces that it directly presses on the hip-bones; and as the width of the bone rather diminishes at the upper part, the principal strain is borne by the posterior sacro-iliac ligaments, from which the sacrum is in great measure suspended."

The part of the burden of the super-incumbent body that is transmitted directly in the line of gravity by the irregularities of the auricular surfaces is very small. For we must remember that these sinuosities are comparatively slight and that they are covered over and separated from one another by thick cartilaginous masses not sufficiently unyielding to transmit directly more than a small fraction of the force they receive. We are thus compelled to admit the very great physiological importance of the posterior ligaments. This is the more readily realized when we consider that half the weight transmitted to the base of the sacrum is conveyed to the right sacro-iliac joint, the other half to the left. "Each of these", says Sappey² "can be considered, in virtue of the parallelogram of forces as again subdivided. A part of the pressure is directed transversely outward and finds itself absorbed in the ligaments. The other part descends vertically and is communicated to the iliac bone

¹Elements of Anatomy, p. 167 1882.

²Anatomy, 1, p. 595, 2nd edition.

which transmits it to the femur." In the sitting posture, he might have added, the point of support is the tuberosity of the ischium.

In these statements we have the suggestion of a physiological fact that, when the weight of the trunk is supported upon the ischia or upon the femora, the sacro-iliac joint cannot rest.

Anatomists are practically agreed that movement in this joint is well-nigh nil so long as the pelvis remains intact. When the pubic arch is removed, however, a rocking is possible as well as a slow gliding motion.

Peculiar changes occur in two conditions of life, namely, in pregnancy and in old age,

In pregnancy, as obstetricians are agreed, relaxation of the ligaments may occur in order to facilitate parturition. The swelling and softening of the articular cartilages is a concomitant phenomenon.

In old age atrophy and fatty degeneration of the same structures is observed in varying degrees.

PATHOLOGY AND PATHOLOGICAL ANATOMY.—The disease which engages our attention here differs from the same morbid process in other articulations only as it is modified by local conditions. The presence of a relatively small synovial membrane enclosed within massive walls composed of cancellous bones and bound almost immovably together by powerful ligamentous bands necessarily causes a modification of the features of the disease. But modified though it be, tuberculosis here must not be made to include any of the other numerous infectious joint diseases to which this articulation is liable. Such a statement seems superfluous; yet, while making the diagnosis of the form of infection, Delens has considered cases of rheumatic and gonorrheal inflammation along with cases of tubercular disease and Tiling has similarly introduced a case of acute infection due to a neighboring osteomyelitis. Even arthritis deformans has secured a place in the discussion. Indeed, while the name sacro-iliac disease, or as the French say, *sacro-coxalgie*, has been theoretically applied only to tuberculosis, it has practically been made to include, at least by very many writers, all of the diseases mentioned. Careful ex-

clusion of such cases would be of less importance if statistical studies were not vitiated by their introduction. This was the case with the otherwise very interesting study of C. T. Poore.

Tuberculosis here presents practically the same gross appearance as elsewhere. The microscopic lesions are also the same; the presence of the bacillus being in every instance the exciting cause of the tubercle-growth. Such being the case we are obliged to accept the theoretical possibility of the disease being primary here, as elsewhere, in the synovial membrane as well as in the bones near the joint. The researches of Schüller demonstrating the intra-articular origin of tuberculosis in the blood effused by traumas have here an important bearing. Schüller found that when one of the larger joints of an animal whose blood contained living tubercle bacilli was injured by the blow of a mallet, typical tubercles sprang up in the neighborhood of the effused blood. Such tubercles contained blood pigment, at once a relic and a proof of their hæmic origin. Such a determining cause may also influence the formation of tubercular foci in osseous tissue. Indeed, Sayre thinks that in every instance of sacro-iliac tuberculosis a trauma is the determining cause. Of primary synovial tuberculosis at the sacro-iliac joint, I am not able to find a single authentic instance of an observation either during operation or at a post-mortem examination. Delens¹ cites the view of M. S. Duplay who thinks that in women in child-bed it is by the serous membrane that the malady begins. Such a case as regards the origin in child-bed is No. 5, Table of Path. Anat. M. Morel presented the specimens of the case to the Société de Chirurgie. Unfortunately the record is not sufficiently complete to enable one to determine the primary focus of the disease. Dr. Satterthwaite, in 1877, presented to the New York Pathological Society a number of specimens from a case of "caries of the lumbar vertebræ, sacrum, ilium and sacro-iliac articulation."² "It was presumed that the fatal issue was due to the passage of pus into the spinal canal, setting up primarily inflammation of the meninges of the cord." "In separating the

¹De la Sacro-coxalgie, p. 24.

²N. Y. Medical Record, 1887, May 26, p. 327.

sacrum from the ilium there was a small spot of carious bone upon the opposed surfaces, the size of a three-cent piece." "Here the observation was quite early, but unfortunately the pathologist has left us no record of the state of the synovial membrane and cartilage. It is probable from the facts that both surfaces were affected to the same extent, and that the affected areas were opposed to each other, that the origin of the disease was between these diseased surfaces, that is, in the synovial membrane; for it is not likely that such surfaces accurately opposed to one another would be simultaneously rendered carious by disease advancing from the two cancellous bones below, since if a single osteal focus had existed, its nearest articular surface would have been more extensively diseased than the opposite bone. That primary synovial tuberculosis occurs in this amphiarthrosis is rendered probable also by the fact that many cases of the disease recover completely after comparatively slight disturbance of either general or local functions. Such cases, a number of which have reached this satisfactory issue in the hands of Prof. Sayre, lead one to think the original lesions must have involved some soft tissue—as the synovial membrane—whose implication gave rise to the symptoms of the disease but which was capable of speedy recovery. An absolute *restitutio ad integrum* is not readily conceivable when any considerable amount of disease is present. But if primary tuberculosis of this very limited synovial membrane ever occurs, a functionally perfect recovery is by no means out of the question. Of course, the limited functional range of the joint as such renders the point practically of very much less importance.

A priori we would conclude that the synovial membrane was far less apt to be primarily diseased than the bony tissue composing the joint, since the bones are of gigantic extent in proportion to the membrane, are very vascular, and are much more exposed to traumatism. As a matter of fact the bones were implicated in all the cases in which they have been examined at surgical operations, or at post-mortem examinations. Here, just as Koenig, Mueller, and others have shown in reference to other bones, we may have not only granulation-mass foci but also true sequestrum foci. For in twenty-

two autopsical observations, sequestra were observed four times ; and Joyeux reports (See Table of Clinical Histories of Cases with Abscesses) a case in which three masses of bone passed at different times by the rectum. It is not our present purpose to detail the processes by which either local extension or recovery takes place. It is sufficient to recall the fact that, when the process is devoid of rapid coagulation necrosis, and fluids are present in minimum quantities, recovery is more common than when tubercular pus is formed and assists in carrying the bacilli to a distance. Indeed, we shall see hereafter that in the whole literature of the subject but one case is recorded (that of Hilton) in which recovery took place without some sort of operation when abscesses had once formed.

The moist form—the form of the disease characterized by cold abscess formation—may be associated with the sequestrum or may originate in the granulation-mass form; it is usually at first simply tubercular in nature but almost invariably becomes at last infected with other microbes than those of tuberculosis, the infection taking place from the blood or from without, generally from rupture or artificial puncture of the abscess wall.

The conditions bringing about tubercular abscess formation, though not severally demonstrated, are capable of being embraced under two heads, those influences favoring the physiological activity of the microbes, and on the other hand the circumstances militating against tissue resisting power. The subject cannot be discussed here, and is only mentioned to permit the suggestion that before abscess formation has occurred, every possible general as well as local advantage should be accorded to the patient in order that he may retain the balance of power.

For, this balance of power once turned in favor of the bacilli, granulation tissue is formed more rapidly than increase of nutrition takes place and the result is coagulation necrosis of the new formed tissue. The cheesy material thus formed, together with a quantity of serum, leucocytes and shreds of connective tissue, constitute the so-called pus which, though exhausted as a culture medium, is capable of carrying the bacilli

of tuberculosis to previously sound tissues whenever the limiting layer of granulation tissue yields to the increasing pressure of the fluid within. If the point of origin of the abscess be in a granulation-mass within the bone, the detritus will reach the surface of the bone by pressure atrophy, as well as by progressive destruction by tubercular inflammation and will attack in the same manner either the periosteum of the bone or the cartilage of the joint according as chance may have located the focus with reference to these tissues. If the periosteum is destroyed it is perhaps still possible that the joint cavity may be reached by local extension along the periosteum. This method of invasion is not demonstrable by reference to known examples, and is rendered less probable by the fact that the joint is enclosed within powerful ligaments which would present almost insuperable barriers to external attack. Usually, however, the periosteum is immediately perforated and the abscess passes into the soft tissues. Assuming that the disease has begun in the synovial membrane, the bone may be secondarily involved by the destruction of the cartilage and tubercular invasion of the surface of the bone or, the detritus having found its way out of the joint, under the periosteum, may dissect up that membrane for a distance and similarly destroy the bone surface, producing what is called superficial caries.

The direction taken by tubercular abscesses is of course that of least resistance. Assuming that the pus has originated in the joint cavity itself or, what amounts practically to the same thing, has found its way into that space before being effused abroad; it seems that both above and below the cleft of the joint the ligaments are so powerful that pus does not find its way through them. At any rate these ligaments in comparison with those at the front and rear of the joint are so much stronger that they are rarely if ever found to yield completely to the dissolving influence of the disease even when it is most advanced. Abscesses, then, leaving the sacro-iliac joint, are at once either intra-pelvic or extra-pelvic. Of fifty-five abscesses collected in Table II,¹ twenty-one or 38.2 per cent were thus extra-pelvic *i. e.*, made their way directly pos-

¹In some cases more than one abscess was noted:

teriorly—while the remaining thirty-eight, or 61.8 per cent, entered the pelvic cavity. The fate of these abscesses is still further seen in Table I.

Of the twenty-one extra-pelvic abscesses, eighteen found their way immediately to the surface, two dissected upward to appear in the lumbar region while a single abscess passed downward to the gluteal region.

Turning to the intra-pelvic abscesses, it will be readily seen that the situation of the ilio-psoas muscle immediately over the joint favors the passage of tubercular matter along its sheath to a very important degree. Thus four abscesses dissected upward to the lumbar region, while eighteen followed this muscle for a varying distance downward to lie embedded in the muscle sheath or to point near the insertion itself. The remaining twelve abscesses seemed to travel directly downward either, on the one hand, to pass out through the sciatic notch, some to point over the gluteus which has been perforated others to make their appearance on the posterior aspect of the thigh; or on the other hand, to perforate the rectum, the perineum or the anus.

Thus it will be seen that abscesses appearing immediately over the joint are invariably extra-pelvic. Those pointing in the gluteal region may be either extra or intra-pelvic, chiefly the latter. These may perhaps be best distinguished by the fact that the tumefaction in extra-pelvic cases is continuous (though not necessarily uniform) from the joint to the centre of the abscess; while in the cases in which the pus proceeds from the sciatic notch the external aspect of the joint presents no connection with the pus cavity. The abscesses in the lumbar region are to be distinguished as to their pelvic relations by the same procedure of tracing the pus pocket back to its point of origin.

The abscesses arising in the sacro-iliac joint and pointing in the femoral region, in the rectum, anus, perineum, or iliac fossa are according to these statistics invariably of intra-pelvic origin.

It is not necessary to enter here into a detailed account of the morbid processes which in these cases are responsible for the destruction of the various soft tissues that may be involved

—cartilage, ligaments, tendons, fasciæ, muscles, cellular tissue and finally the skin. Examples of the extent of such destructive action of the disease are not wanting in the table devoted to Pathological Anatomy.

It will be noted on the other hand that a part of the resisting energy of the patient is devoted to the production of osteophytes which at times are so extensive as to interfere with the functions of the pelvic viscera.

ETIOLOGY.—Velpeau¹ as long ago as 1862, noted that sacro-iliac tuberculosis was met "at all ages, in private and hospital practice, among the rich and the poor." Somewhat difficult to account for is the fact shown in the following compilation, that children are not so frequently affected by the disease as older persons. Of thirty-two cases in which the age was recorded, there were of those

Less than five years of age,	-	-	-	-	3
Between five and ten,	-	-	-	-	2
" ten and fifteen,	-	-	-	-	2
" fifteen and twenty,	-	-	-	-	7
" twenty and twenty-five,	-	-	-	-	12
" twenty-five and thirty,	-	-	-	-	1
" thirty and thirty-five,	-	-	-	-	1
" thirty-five and forty,	-	-	-	-	1
45, 55 and 61, each one,	-	-	-	-	3

Thus less than twenty-two per cent of the cases were below fifteen years of age; the same proportion were between fifteen and twenty years of age; while in the fifth lustrum of life we find twelve cases recorded, just $37\frac{1}{2}$ per cent of the whole number. All the remaining years of life furnish only six cases, less than 19 per cent. The fact that traumatism of rather a severe nature has been recorded in so many cases would lead one to think that the disease occurred in those enabled by virtue of their vigor of years to engage in those pursuits in which violence was possible. It may be for this reason that children are so rarely affected. Prof. Sayre believes that traumatism is invariably an element in the etiology of the disease. A reference to his cases published in this article will do much toward inducing the reader to concur in this belief.

TABLE I.—PATHOLOGICAL ANATOMY.

No.	Observ- er. Where pub- lished.	Miscellaneous Information.	No. of Abscesses or Fistule. Location.—Extra-Pelvic. Intra-Pelvic.	Bones.	Ligaments.—Synovialis.—
				Cartilages.	Other soft parts.
1	Hahn, Ueber die sa- cro-cox- algie, Stutt- gart, 1833, Delens.	Autopsy.— Male, æt. 19, caries of lumbar ver- tebræ, bod- ies of 2d, 3d and 4th, left sacro-iliac disease.	Two abscesses connected together, joint full of pus. Pus passed through sciatic notch into buttock. Pus passed below iliac mus- cle toward anus.	Surfaces of bones of s. i. j. carious. Cartilage destroyed.	Ligaments and muscles mixed with suppurating mass, difficult to distin- guish them.
2	Hahn, as a- bove, Delens.	Autopsy.— Male, æt. 20, caries of bodies of 3d, 4th and 5th lumbar ver- tebræ, with destruction of their car- tilages.		Separation of sacrum and ilium; latter two in. more elevated, its carious posterior extremity could be cut with knife, ca- ries of sa- crum in- volves the three false transverse superior apophy- ses as far as the fo- ramina, cartilage almost destroyed.	Sacral nerves bathed in pus, muscles degenerated and infiltrated with pus.
3	Hahn, Ueber die sa- cro-cox- algie, Stutt- gart, 1836, Delens.	Left s. i. d. Male, 25, an inward deviation of right thigh caused right knee to be carried un- der left.	Several blind fistulæ, con- gestion abscess on right, going from 3d lumbar vert- to lower extremity of rec- tum without osseous alter- ation. On left, abscess from Poupart under psoas to l. s. i. j. with degeneration of muscles, purulent tract from joint to tuberosity of ischium.	Symphysis ossified a- bove and behind, rest of art- icular surfaces denuded of caril- ages and presents here and there ca- ries, sa- crum ca- rious be- hind.	Psoas degenerated.
4	Nichet, Gazette Méd. Delens.	Right side.— Male, 18, complete destruction of cartilages 1st and 2d lumbar ver- tebræ, ne- crosis of 2d 3d and 4th lum. vert. died of per- icarditis.	Fistulous tracts extend from first lumbar vertebra to trochanter minor following internal border of psoas.	Cartilage of joint de- stroyed and bones play on each oth- er, sacrum much sof- tened.	Periosteum over anterior part of sacrum and s. i. j. elevated by mass of tuber- cular matter.

Observ- er. Where pub- lished.	Miscellaneous Information.	No. of Abscesses or Fistulae. Location.— <i>Extra-Pelvic.</i> <i>Intra-Pelvic.</i>	<i>Bones.</i> <i>Cartilages.</i>	<i>Ligaments.— Synovialis.—</i> <i>Other soft parts.</i>
5 Bulletin de Soc. de Chir. Mar. 18, 1857, Delens. M. Mor- el.	A puthistical woman had sacro-coxal- gie follow- ing ac- couchement			
6 Hulke, Trans Path. Soc. of London vol. xiv p 208, 1863 Delens.	Child, pale and feeble, æ. 8 years. Abscess. Died of tu- bercular pe- ritonitis.	Abscess pointed and open- ed spontaneously, 4, mo. before death, in buttock near great trochanter, fis- tula ended in little cavity, in post. inf. spine of ilium and up to lateral masses of 4th and 5th sacral vert.	This cavity contained a very small free seques- trum from 4th piece of sacrum Joint was full of pus which de- pended on necrosis.	Remains of softened carti- lages still clung to articu- lar surfaces.
7 Courty, Ar. Bos- sin Dic. of Med. ii: thirty vol. T. V	Male, æt. 17. Died of in- termittent fever, R. s. i. d.	Pus diffused. 1. In front of pyramidalis, as far as sci- atic notch and side of right iliac muscle. 2. Mounted up psoas to lev- el of 3d lumbar vertebra.	Tolerably manifest alteration of anterior face of sa- crum.	
8 Stoll, Delens, R. s. i. d.	See Clinical History. Pulmon- ary phthisis	One abscess. Extra-pelvic.	Articular surfaces carious.	Intra-articular ligaments destroyed. Soft parts, cel- lular tissue, etc, in yel- lowish white mass which maintained bones in con- tact.
9 Observa- tion of Larrey. These de Hat- tute, Paris, 1852, Delens, R. s. i. d.	Hip joint and spine sound	1. Started from sciatic notch and occupies region be- neath gluteus maximus. 2. In sheath of psoas and iliacus <i>tœtid</i> pus. 3. Abscess over s. i. j.	Bones could be easily separated from one another by pres- sure. Tis. of 2 bones is friable, soft and infiltrated with pus. On sac- rum caries extends at several points to the spinal canal; in ilium it extends above two finger breadths outside of joint.	Muscles below the subcuta- neous abscess of the glu- teal region and the psoas and iliacus are softened and infiltrated with gray- ish pus. Post sacro-iliac ligaments anterior and su- perior completely destroy- ed, were sought for, but no traces found. The post. vert. ligament, converted into jelly, was detached from its iliac insertion. Periosteum dissected up for two finger breadths beyond joint, both on ili- um and sacrum.

Observ- er. Where pub- lished.	Miscellaneous Information.	No. of Abscesses or Fistule. Location.—Extra-Pelvic. Intra-Pelvic.	Bones. Cartilages.	Ligaments.—Synovialis.— Other soft parts.
10. Obs. of Weiss. These de Hat- tute, Delens, R.s.i.d.	See Clinical History, No. 10, tubercu- lar cavities in lungs, tu- bercular ul- cers in in- testines.	Large abscess below gluteal muscles communicates with pelvic cavity by s.i. j. open behind sciatic notch. 2. Purulent depot in iliac fossa. Iliac fossa stripped up, s.i.j. opened, pus ex- tending down to middle of thigh and upward to 10th dorsal vert. whose transverse process is slightly carious.	Articular surfaces of sacrum and ilium are pro- foundly carious.	
11. Bul. de la Soc. Ant. 38, p. 221, Delens, Seques- trum.	See Clinical History, tu- bercles in right lung.	1. Abscess of buttock of two pockets; one subcutane- ous, superficial, other sub- muscular, communicating with one another across frayed fibres of partly de- stroyed gluteus maximus. 2. Pocket in front of s.i.j. extending from base of sa- crum to edge of 4th ant. sacral foram. embracing the four corresponding sa- cral nerves. Joint perfora- ted by abscess.	Ex. surface of il. de- nuded and cari- ous over a circular extent of five cent. diameter. In pocket 2 some pus with a little se- questrum comple- tely detach- ed; surfa- ces of bone cari- ous and ir- regular. This change in the sacrum extended to the whole part cor- respond- ing to the 4 ant. sa- cral fora- mina, on the ilium, the whole articular surface and some centime- ters a- round. The most advanced part is at upper part of joint. Os- teophytes in front of joint are large.	Great sciatic. nerve is sepa- rated only by a slight lay- er of grayish matter ex- plaining sudden pain caused by injection. In joint, no cartilage, no syn- ovialis, no superior and anterior ligaments. Inter- osseous ligaments easily divided and hence altered.

No. <i>Observ- er Where pub- lished.</i>	<i>Miscellaneous Information.</i>	<i>No. of Abscesses or Fistulae. Location.—Extra-Pelvic, Intra-Pelvic.</i>	<i>Bones. Cartilages.</i>	<i>Ligaments.—Synovialis.— Other soft parts.</i>
12 Obs. of Gouraud Thesis of Boissarie, '62 Delens, L.s.i.d.	See Clinical His. No. 12. Other organs sound.	1. Vast burrow divided in two parts by gluteus maximus, one superficial, the other deep, passing under aponeurosis of sacro-lumbalis and long dorsal muscles. This communicated with s.i.j. by an orifice between sac. and il. at iliac spine, which is denuded and rough. 2. On both sides in psoas were circumscribed abscesses without communication with neighboring parts. 3 Small pocket on anterior face of sacrum, between 2d pair of sacral foramina; another pocket over a carious spot in sacrum.	Articular surfaces covered with bleeding fungosities in midst of which were bone fragments necrosed or carious	
13 Obs. of Gadaud Bul. de la Soc. Anat. 1865. Delens, L.s.i.d.	See Clinical His, No 13	In internal iliac fossa much pus. S.i.j. full of pus.	Section of sacrum shows an abscess with in it separated from s.i.j. only by a very thin layer of bone. Bones were altered. Fibro-cartilage destroyed.	Atrophy of muscles of affected side. Commencing degeneration. Nothing in vessels. Tuberculosis of lumbar glands.
14 A. Bou-naix. These de Paris 1874, R. s.i.d. Phthisis pulmonalis.	See Clinical History No. 14. Right lung, extensive tuberculosis; left lung less extensive. On left deep muscular veins full of black coagula, which do not pass the point of emptying in to internal iliac. No phthisis.	Pus in psoas muscle follows it and goes to trochanter minor where there is a pocket. S.i.j. full of pus which also runs into length of pyramidalis, passes through sacro-sciatic foramen into gluteal muscles.	Ilium denuded quite extensively over ant. face. Femur denuded about the trochanter minor.	Right iliac fossa, psoas contains pus pocket at the level of 3d lumbar vertebra. Pus had run along fossa, denuding the ilium as far as crista ilii. Fatty degeneration of muscle around fistulae.

<i>No.</i>	<i>Observer. Where published.</i>	<i>Miscellaneous Information.</i>	<i>No. of Abscesses or Fistule. Location.—Extra-Pelvic. Intra-Pelvic.</i>	<i>Bones. Cartilages.</i>	<i>Ligaments.—Synovialis.— Other soft parts.</i>
15	A. Bou- naix, as above. L.s.i. d.	See Clinical History No. 15. Right joint sound. No tuber- cles in lungs	Sheath of psoas of same side full of pus down to tro- chanter minor At level of s.i.j pus breaking out of joint has perforated the gluteus max. and skin 2d. abscess pocket arises from altered bone at level of left branch of pubic bone. This follows the sheath of the femoral vessels and directs itself towards the internal part of femur opening at back of thigh thus enveloping the sci- atic nerve.	Bony sur- faces of s. i.j. deep- ly carious. Perios- teum of ilium and femur over- grown with oste- ophytes. Two large ones along psoas.	Pus pocket in right side of psoas.
16	A. Bou- naix, These de Paris 1874, R. s.i. d.	See Clinical History No. 16. Lungs riddled with tubercles. Hip—Vast collection of pus at exter- nal part of thigh. Cap- sule open behind and communi- cating with this pocket. Head of fe- mur exten- sively dis- eased.		Ilium denu- ded in a line ex- tending from pos. sup. spine of ilium towards cotyloid cavity, where peri- osteum is elevated and bone shows ap- pearance of "rari- fying os- teitis."	Ilio-sacral ligaments partly destroyed. As to s.i.j. the cartilages were softened and had undergone the commencement of de- struction, but there was no suppuration.
17	Tilg, St. Pe- ter-bur- ger Med Woch. July 23, 1883. Opera- tion. Seques- tra.	See Clinical His. No. 17. M. Patho- logical con- dition of in- testines not mentioned.	The abscesses present are described under the head of clinical history.	Bones showed extensive osteopo- rosis of ilium, nu- merous sequestra and slight formation of osteo- phytes. Tuber- sity of ilium almost gone; had been re- moved by eviden- t and of course with it the articular surface.	

No.	Observ- er. Where pub- lished.	Miscellaneous Information.	No. of Abscesses or Fistulæ. Location.—Extra-Pelvic. Intra-Pelvic.	Bones. Cartilages.	Ligaments.—Synovitis.— Other soft parts.
18	G. Til- ling, St. Peters- burger Med. Woch. July 23, 1887, L. s.i.d. Opera- tion.	See Clinical History No. 18. M. Acute tuberculosis of both lungs. Super- ficial car- ries of ant. surface of sacrum, 5th and 4th lumbar vert. and left lat- eral surface of sacrum, condition of intestines not men- tioned.	A large sub-gluteal abscess was found at the opera- tion. This was found com- municating with a large cavity in the hollow of the sacrum by way of the sacro-sciatic notch.	The Tuber- osity of the ilium was at most com- pletely gone hav- ing been removed at the op- eration as also post- sup. part of sac. sci- atic no ch.	
19	J. B. Mustin L.s.i.d.	See Clinical history.	Large cavity with a firm wall on dorsum of ilium, occupying place of gluteal muscles. Another in iliac fossa was connected with first through sacro sciatic notch and also in front.	The ilium and sac- rum were "honey- combed" especially the sac- rum.	On left side iliac vessels im- bedded in the pseudo- membranous mass of iliac abscess. Artery was not diseased. Vein much shriveled, contained a clot. Vena cava below the renal veins occluded by a clot, which extended into right as well as left iliac vein.
20	Dr. Mas- son, N. Y. Med. Record. Dec 25, 1875. R. s.i.d.	See Clinical history.	Abscess passing down be- low Poupart's ligament.	Extensive erosion of bones with de- struction of the lig- aments.	
21	L. A. Sayre, Orth. Surg. 1883, p. 353. Double s.i.d.	4. M. See Clinical History Coxa healthy.	Extensive abscesses down psoas muscles, on left [1] passing out above Pou- part's ligament; on the right [2] passing below and down thigh.	Extensive carries at both s.i. joints.	
22	Dr. Satter- thwaite, Med. Record, May, 26, 1877.	54. M. Re- mark. There had been no pain on approximat- ing the ilia and no ten- derness over s.i.j.	Extensive abscess down- ward and backward from the crest of the ilium to the spine, which was car- ious.	A small car- ious spot was found upon the opposed surfaces of the sac- rum and ilium.	

TABLE II.—STATISTICS OF ABSCESSES IN SACRO-ILIAC TUBERCULOSIS.

Extra-Pelvic.	Pointing posteriorly.—18 Abscesses—[i. e. immediately over the joint].	{ Nos. 44, 1st; 45, 1st; 9, 3d; 53, 1st; 15, 2d; 44, 2d; 8; 10, 1st; 11, 1st; 13, 1st; 14; 48, ... ; 52, 2d; 53, ... ; 17, ... ; 18, 1st; 55, ... ; 56, ... ; 58, ...	
	Dissecting upward (pointing in lumbar region).—2 Abscesses.	{ No. 43, 2d; No. 57.	
	Dissecting downward (pointing in the gluteal region).—One abscess.	{ No. 43, 1st.	
Intra-Pelvic.	Dissecting upward to lumbar region.—4 Abscesses.	{ Nos. 4; 7; 10, 3d; 59, 1st.	
	Dissecting outward and forward.	{ Under periosteum. No example at hand.	
		{ Without finding exit anteriorly; 7 abscesses. Nos. 3, 11, 2d; 12, 13, 2d; 49; 50; 51, 2d.	
	Dissecting directly downward.	Under ilio-psoas.	Toward insertion of ilio-psoas; 11 abscesses. Nos. 3, 4, 10, 2d; 46, 14, 1st; 15, 1st; 54, 21, 1st and 2d; 20, 59, 2d.
		1. Out through sciatic notch.	{ Through gluteus. 5 Abscesses. Nos. 1, 1st; 9, 1st, 14, 2d; 18, 2d; 19. Downward to thigh. Nos. 44, 3d; 6; 7.
		2. Inward toward ischio-rectal fossa to	{ Rectum: Nos. 45, 2d; 2. Perineum or anus: Nos. 1, 2d; 9, 2d.

* The numbers refer to the record of cases in the other tables.

Closely associated with the idea that traumatism is an important factor in the causation of the disease is the fact that the occupation of many of the adult patients has been such as to favor violence. Thus several of the victims of the disease were gunners, accustomed to ride on jolting caissons. Some of the women were laundresses. And the children affected were chiefly those addicted to violent sports.

Sex as an element in the etiology, seems on account of exposure to traumatism to favor the development of the disease in the male, if we except the especial liability to the disease of parturient women.

To determine the relation of these factors even approximately would require a much greater number of recorded cases than are as yet at hand.

SYMPTOMS, COURSE, DURATION.—The classification of symptoms published by Erichsen in 1859 was so convenient on account of its adherence to the succession of clinical phenomena that it has served as a model for almost all the writers who have since studied the disease. Erichsen regards the chief symptoms as five in number—pain, lameness, changes in attitude and length, tumefaction and abscess.

The pain¹ varies in character, intensity and seat, and differs in these respects with the period of the disease. "One of the earliest symptoms," says Erichsen,² "is a sensation of painful weakness at the lower part of the back and sacrum increased by movements of the body in walking, stooping, or even in standing, giving the sensation as if the body were falling asunder." Chouppe observed that the discomfort caused by movements rendered the patient lazy. But not only movements are painful, but even the maintenance of the sitting or standing posture.³ Indeed, when the disease affects both joints, M. Duplay observed that the patient could not sit up at all. Conversely, however, when the patient lies down for a time and thus completely rests the joint, pain disappears—at least at the beginning of the disease. Though at first the pain is intermittent or even fugitive, coming on only after exertion, it usually becomes after a time constant and severe. Lifting heavy bodies becomes impossible and soon the patient cannot sustain his own weight. When abscesses have formed the pain is usually worse than before though it is generally somewhat relieved by removal of the fluid.

¹Delens, *De la Sacro-Coxalgie*. p. 46.

²Braithwaite's *Retrospect*, Part 39, 1859.

³Johnstone. in *Holmes' System of Surgery*.

The seat of the pain is by no means constant. Delens¹ makes the important statement that "Spontaneous pain always



—' ROF. SAYRE'S CASE.—REV K., SHOWING POSITION CHARACTERISTIC OF SACRO-ILIAC DISEASE.

exists to a certain degree at the level of the articulation, or at least it can be made to occur there by external pressure, or by pressure through the rectum, the finger being carried to the level of the symphysis."

Pressing the ilia towards one another produces usually the symptom of pain in the sacro-iliac joint, which is almost pathognomonic. Lying on the affected side is usually impossible on account of pain caused by pressure upon the joint. Pressure on the greater trochanter does not cause pain if the pelvis is steadied and carefully supported. The pain may not be confined to the region of the joint and of the buttock, but may extend to the anus and the leg. This may be on account of pressure from an abscess on the nerve trunk, as in the case of M. Guéniot, in which the sciatic nerve was pressed upon by a pus pocket. In some cases, as noticed by Langier, Hilton and Velpeau, the pain extended even to the knee.

From the fact that pain is occasioned by movement, lameness naturally follows—usually worse toward the close of a day's activity. As Gosselin² has pointed out, the gait is usually in

¹De la Sacro-coxalgie, p. 47.

²A. Bounaix, Thèse de Paris, 1874.

small steps, since more extended ones involve the joint by calling the pelvis into action, and cause severe pains. On account of the habit of walking with the greater part of the weight thrown on the sound side, the pelvis is habitually tilted and from this results the "position hanchée" of Hattute. Prof. Sayre regards this position as characteristic, and has kindly sent me a photograph of the case of the Rev. K. illustrating it. (Fig. 1).

Stoll observed a dragging of the affected limb. The point of the foot does not usually deviate (though there are exceptions) and Hahn attaches much diagnostic importance to this symptom. From the fact that in locomotion the arc is diminished in which the leg swings, the muscles concerned in the act are atrophied to a greater or less extent depending on the duration and severity of the disease. In this way the buttock comes to have a flat appearance.

Such alterations in the size and shape of the limb are far more real and important than the changes supposed to occur in its length. This branch of the subject was given undue prominence in a former generation by Hahn, who, influenced by prevailing ideas on *morbus coxarius*, admitted a lengthening of the limb in the second period, followed by a shortening at the commencement of the third or the end of the second, occasioned by changes in the relation of the ilium to the sacrum. The investigations of Broca have strongly influenced the students of the disease and Delens¹ goes so far as to say that he regards these changes as always apparent and they are due, as in *morbus coxæ*, to vicious positions which the pelvis takes itself, or to movements of torsion or flexion which take place in the lumbar column. This view is strengthened by the fact that the massive ligaments of the joint yield completely to the disease only in the most advanced stages and most severe forms. Moreover, the symphysis pubis always remains as a support and would prevent any considerable displacement. And as the displacement must be slight in degree, statistics of mensuration will always be questionable

¹De la Sacro Coxalgie, p. 51.

since our landmarks are not capable of accurate mathematical location.

The swelling overlying the superficial aspect of the joint, though not always present, is, when found, a valuable diagnostic point. The intumescence is usually somewhat elongated from above downward but, until suppuration has occurred, the area involved in the swelling is not great. Rectal touch is useful in determining the condition of the anterior aspect of the joint.

The symptoms of abscess formation fortunately do not occur in all cases. If they are noted at all they occur in the later stages of the disease. The evidence of the occurrence of abscess consists in a more or less gradual increase in the dimensions of the tumefaction accompanied by boggiess at first and terminating in fluctuation. The points at which abscesses make their appearance and the various directions that they may take have already been referred to.

Another symptom of importance was noted by Johnstone in Holmes' System of Surgery—local elevation of temperature over the joint. Prof. Sayre has utilized this phenomenon in making diagnoses, with satisfactory results.

From such an account of the symptoms that may occur it will be seen, I believe, that the most natural and convenient division of the course of the disease consists in its consideration in two stages—the first embracing the phenomena before, the second, those after the formation of abscesses. Hence the second stage is often absent.

The beginning of the disease is insidious. Often without being preceded by a trauma sufficiently severe to attract the individual's attention, the patient will notice a feeling of discomfort at the close of days of activity and perhaps a slight pain in the hip or knee. In a few days, increasing pain and lameness admonish him to consult the surgeon, who finds tenderness and swelling over the joint, together with a slight local rise of temperature. Without appropriate treatment the symptoms become more pronounced, the patient soon finds himself unable to walk about, and after some months is confined closely to his bed, though in one of Bounaix's cases the patient could walk about, even with a drainage tube in his buttock. Then it is

that abscesses make their appearance, ushering in the second period of the disease, and usually increase in size until they find their way to the outside air, or into a hollow viscus. Once mixed infection has occurred the patient begins to suffer from *sapræmia* and either with or without true *septicæmia* comes to his death. Concomitant and incidental diseases of the viscera, however, carry off perhaps a larger proportion of the patients than the causes just mentioned.

DIAGNOSIS.—The diagnosis of tuberculosis of the sacro-iliac joint implies not only the exclusion of diseases in neighboring structures but also the exclusion of other pathological processes within the joint itself. As has been already suggested in this paper, the sacro iliac joint is liable to many of the forms of inflammation that occur in other joints, namely, the various forms of suppurative inflammation, acute and chronic, primary, metastatic and osteomyelitic, as well as gonorrheal rheumatism, acute articular rheumatism and arthritis deformans. Though they probably exist, examples are not at hand to demonstrate the occurrence of the arthritis of tabes, of syphilis or of gout. Besides the inflammations, Delens, and following him, Bounaix have suggested the propriety of excluding cancer, fibroplastic tumors, enchondromas and hydatids. But as no observer has as yet recorded any difficulty in the exclusion of these diseases their introduction is based on purely theoretical considerations. A syphilitic or gouty inflammation would require exclusion by a recognition of characteristic lesions elsewhere or by the history of the case. The same might be said of arthritis deformans and of the various forms of rheumatism. But in the acute forms of rheumatism the element of duration will materially assist in the diagnosis. Moreover the tenderness in rheumatism is generally much greater than in tuberculosis. The suppurative lesions are distinguished readily by the very fact of suppuration, the question of an addition of suppuration to tubercular inflammation being excluded by the history of the case.

But it is in the exclusion of the diseases of parts entirely foreign to the joint that the greatest difficulty arises. By dividing these diseases into three classes according to the lucid

arrangement of Delens the obscurity is much relieved. These classes are

1. Neuralgic affections.
2. Affections of muscles.
3. Affections of bones and neighboring joints.

The painful affections of the large and numerous nerve trunks of the lumbar and pelvic regions are more frequently substituted, diagnostically, for tubercular disease of the sacro-iliac joint than *vice versa*, e. g., Prof. Sayre's case of Rev. K., in which two eminent New York surgeons overlooked the disease in the joint and diagnosed inflammation of the sheaths of the lumbar nerves. Lumbo-abdominal neuralgia must be distinguished by careful reference to the painful points of Valleix as well as by attention to the resemblance to other forms of neuralgia. The very common neurosis, sciatica, is frequently regarded as the cause of pain which in reality is due to sacro-iliac disease. It is to be remembered that sciatica generally occurs in older persons than sacro-iliac disease; that in the former malady, the pain runs down the leg, while in the latter it is confined to the joint; and that in the former the pain is constant and, a point especially important, is not relieved by rest. But the surgeon will recall the possibility of sciatica co-existing with the joint disease. Moreover, the sciatic nerve may, as in Gueniot's case, be directly involved in the disease so that pain is felt, even more severe than that of sciatica.

Of the group of diseases implicating the muscles about the joint lumbago is the most common. In it the tenderness is found to be greatest over the lumbar region and not over the joint. In lumbago, also, the pain is not confined to one side of the spinal column and is called forth by flexion and extension of the trunk. Of course the symptoms characteristic of the sacro-iliac disease other than pain are wanting. Affections of the psoas muscle are specially associated with flexion of the thigh on the pelvis with inward rotation of the foot. This sign¹ is almost pathognomonic; at any rate it has never been observed in sacro-iliac disease. In psoitis there is no pain at the

¹Delens, "De la Sacro-Coxalgie," p. 65.

posterior part of the joint nor does lateral pressure on the pelvis produce pain.

The affections of the bones composing the joint or lying close to it are, perhaps, when associated with abscess formation, most difficult of exclusion. A diagnosis is to be reached by a careful search for positive symptoms of joint involvement, and failing in finding them, a thorough examination is to be made with reference to the origin of the disease in the bones themselves. If fistulæ are present, the diagnosis may be facilitated by their exploration.

Tuberculosis of the vertebræ is to be excluded by the absence of tenderness over the spinous processes, and the numerous other positive symptoms of Pott's disease. It is only when this disease occurs in the lumbar vertebræ or is associated with abscess formation that the diagnosis is confusing. It is then to be decided by the local symptoms of tenderness, elevation of temperature over small areas, and tumefaction. In disease of the vertebræ the patient would use both limbs alike, so that the symptom of lameness would be absent. In all efforts to obtain a diagnosis we must not neglect the attempt to elicit pain by the pressing of the ilia toward one another.

The presence of this symptom, together with the absence of pain on moving the thigh when the pelvis is steadied, will exclude morbus coxarius. Indeed the writer would suggest that a search for the symptom of pain on pressing the ilia together be adopted as a part of the routine in the diagnosis of morbus coxarius, for the exclusion of sacro-iliac disease, since in his opinion the majority of cases in which failures of diagnosis were made depended not so much on the inherent obscurity of the disease, its lack of characteristic symptoms, as on a hasty and over-confident diagnosis of the familiar and often somewhat obscure tuberculosis of the hip-joint. In addition to this point are to be noted the difference in attitude of the two diseases, the different forms of lameness, the occasional tenderness by rectum of the anterior aspect of the sacro-iliac joint in the one disease, of the acetabular region in the other, and in the abscess forms of the disease in the usually obvious difference in the origin of the abscesses.

TREATMENT.¹—The diagnosis of sacro-iliac disease was among the earlier observers of the malady, that is, from 1821 to 1859, on a rather uncertain footing, and was chiefly confined to a recognition of the disease in the stage of suppuration. The treatment of the disease was not likely to have been carefully formulated in the earlier stages when the earlier stages themselves were generally unrecognized. But the symptoms of the disease, though not recognized as belonging to sacro-iliac tuberculosis, were treated in that vigorous way in which the same manifestations were combated in other and well diagnosed ailments. The surgeons of that day were masters of the use of counter-irritants, frictions with liniments, painting with various drugs, application of cups, leeches, moxas and setons, production of blisters, the acupuncture and the actual cautery. These were used empirically by all who were puzzled by the vague symptoms of the disease in the early stages, as well as advised by those who had diagnosticated their cases in the beginning. Erichsen who, in 1859, may be said to have represented the earlier students of this subject—Boyer, Velpeau, Larrey, Langier, Frère, Girauld de Nolhac, Delineau, Joyeux, Maisonneuve, Nélaton and Gurlt—formulated very briefly the principles of treatment as follows: "The treatment must be conducted on the same general principles that guide us in the management of cases of carious disease of the spine. Rest in the prone position; counter irritation in the earlier stages before suppuration has set in—after that has occurred this is worse than useless—opening abscesses, when large and chronic by valvular incision, and keeping up the powers of the patient, are the means that must be had recourse to, but usually unfortunately, with little advantage beyond the mitigation of suffering and the prolongation of life for a limited time. I need hardly say that operative interference is not admissible here."

This plan of treatment begun without hope, ended, as Erichsen regretfully confessed, without success. For although rest in the prone position was recommended, it was carried out, not

¹A portion of the ideas expressed in this section were advanced at the meeting of the American Medical Association, May, 1888.

rigidly and with mechanical accuracy, but with an apathy clearly indicating a lack of appreciation of its value. But while they advocated rest they positively forbade operative interference, and that too, as indicated by the quotation from Erichsen, in a way that precluded opposition.

Prof. Sayre has kindly referred me to the record of a case occurring in his practice six years before this dictum of Erichsen's, that was treated in a manner directly opposite to that advised—so far as operation is concerned—and with a result equally refreshing. The case occurring at that early date—1853—deserves to be given in detail. Indeed it is a matter of regret that it was not published at the time.

CASE 57. A. M. S., æt. $2\frac{1}{2}$ years, fell behind a trunk in the autumn of 1852. Some months after he had an abscess in the lumbar region which was opened by a valvular incision by Drs. Parker and Mott. In a few weeks it refilled and was again opened by a valvular incision by Drs. Parker and Mott, and partly emptied. Hectic symptoms supervened, and the patient was sent to the country where he grew rapidly worse and became greatly emaciated with hectic fever and loss of appetite. I was sent for to see him in the country, as he was thought to be dying. In September, 1853, I had urged Drs. Mott and Parker to open the abscess by a free incision at each of the former operations; but they said it would be fatal. The father of the child knowing the different opinions of myself and Mott and Parker, told me that as the child was dying and the former operations had done him no good, to do as I liked with the case. I immediately made a free incision of three or four inches in the line of the sacro-iliac junction and gave exit to a large amount of pus and sloughing connective tissue was pulled away by the forceps. The sacro-iliac joint was distinctly open and denuded of its articular cartilage, roughened bone being felt, both on the ilium and sacrum. Not having anything but my small pocket-case of instruments with me, I took a large and curved knife which the grand-father had for pruning trees, and with it scraped and removed all the carious bone that I could reach. The wound was filled with Peruvian balsam and stuffed with oakum.

"That night the child slept well, and in the morning was better than he had been for months, and ate freely for the first time in some weeks.

"From this time he went on to rapid recovery, the wound being dressed daily and packed with oakum and Peruvian balsam to the bot-

tom until it granulated firmly and healed perfectly in about three months.

"He grew to be a strong and vigorous man, was a civil engineer of great energy and activity, was always in perfect health until at the age of 32 years he fell from a roof of a house and was wounded in the foot by a nail. Lockjaw ensued and the man died."

This, the earliest case, so far as I can ascertain, in which *évidement* was practiced, not having been published, exercised no influence on the practice of surgeons in general in such cases until the *Orthopedic Surgery* of Prof. Sayre was published a few years later.

Two of the remarkable cases of Hilton had come under the care of that distinguished surgeon in the same year as that of Sayre, viz., 1853. These cases together with two others occurring in 1857 and 1861 respectively, were not made public, except perhaps in his clinical lectures, till the celebrated work on "*Rest and Pain*" was published some years afterward.

The application of complete mechanical rest was one of the most valuable lessons taught in the pre-antiseptic era, and was perhaps most strongly inculcated by Hilton.

But the recognition of the need of avoiding mixed infection was manifest in the advice of Erichsen, who only voiced the sentiment of other surgeons in declaring that incisions should be valvular. Later on the aspirator was used quite extensively. Many operators, however, fell into the error of using only a small valvular incision in cases where mixed infection had already occurred. One surgeon even closed up with collodion a *foetid abscess* that had opened spontaneously. But in almost all cases a free incision was promptly made where the abscess became *foetid*.

Delens, in 1875, formulated the treatment adapted to three stages of the disease. In the first of his divisions—where only pain and lameness were present—he recommended the relief of pain by the use of chloroform liniment with friction and by the use of morphia. Rest was to be carried out by the dorsal decubitus in bed; and if the patient rose up he was required to use crutches and a pelvic bandage. In case

of women recently confined, great care was enjoined, a pelvic girdle being used and prolonged rest required.

Bogginess and swelling initiated, with Delens, the second set of indications, requiring revulsives from tr. iodine and fly blisters to the red-hot iron. Delens mentioned Larrey¹ as authority for moxas, avoiding bony prominences. Immobilization was to be secured by means of M. Verneuil's apparatus embracing the pelvis and applied to the affected limb.

It is at this point that Delens² takes occasion to condemn operative interference except for the extraction of sequestra.

After suppuration has occurred he recommends, in cases where necessary, aspiration, puncture with the trocar, opening by means of Vienna paste, or drainage and injection of tr. iodine after the manner of Chassaignac in other joints. Delens does not neglect, however, to remind us of two cases of M. Velpeau which died after opening, on account of secondary infection.

Adrien Bounaix,³ in a rather long thesis, devotes himself chiefly to the reporting of four new cases rather than to a discussion of the modes of treatment. He recommends rest by fixation; forbids opening of abscesses, if it is avoidable, but demands drainage if the opening is made.

In a clinical lecture of 1876, Christopher Heath⁴ says that operating is a very serious matter indeed. He discountenances the use of the extension but recommends a pelvic belt.

Poore, in his article on sacro-iliac disease in 1878,⁵ does not add anything to the subject of treatment.

In 1879, Prof. L. A. Sayre⁶ advises in the early stage leeching, the ice-bag,—then counter-extension and the actual cautery, if there is much pain. If it is advisable to use fresh air treatment, he advocates the use of a shoe with the heel and sole higher on the sound side.

¹(Clinique Chirurgicale, III, p. 330).

²Delens, "De la Sacro-Coxalgie," p. 82.

³Contribution à l'étude de la Sacro-Coxalgie. Thèse de Paris, 1874.

⁴Brit. Med. Jour., Vol. II, p. 781.

⁵Am. Jour. Med. Science, Jan., 1878.

⁶N. Y. Med. Record, Feb. 15.

John Wood¹ recommended counter-extension and double extension, that is, the application of an equal weight to each leg. He regards unilateral extension as useless and injurious.

Dr. G. Tiling² details the operative treatment adopted in two cases which nevertheless terminated fatally. His valuable remarks will be referred to again.

F. J. Gant³ published last year an account of two cases in which operative interference was successful.

Recovery may take place in local tuberculosis at the sacro-iliac joint, as in local tuberculosis elsewhere, after the spontaneous removal of fluid or solid detritus through the aid of the surrounding healthy tissues; after the partial resorption of the detritus and the encapsulation of the remainder (as may occur when sequestra are present); or after complete discharge of tubercular matter externally. In either case healing takes place by the formation of a cicatrix from the granulation tissue about the periphery of the focus. If, then, recovery only takes place after the tubercular detritus is thus disposed of, we conclude readily that the smaller the amount of detritus to be removed the more favorable, *cæteris paribus*, will be the case for recovery. Such is the fact. For after cold abscesses have formed, the percentage of recoveries is much smaller than when no abscesses are present. But this fact is due not only to the large amount of detritus present, but also to the invasive character of the disease, its tendency. When the tendency of the disease is toward resorption and scar-formation, recovery is to be expected. The elements active in determining this tendency are as yet undemonstrated. Koenig has long ago distinguished between a "dry, granulating form" tending to recovery and a "moist form" in which coagulation-necrosis is rapid and peripheral extension is progressive. In our study of the pathology of the disease we have already seen that the original nature of the disease, as regards manner of infection, has much to do with the extension or the limitation of the dis-

¹British Medical Journal, June 5th, 1880.

²"Ueber Erkrankung des Ileo-sacral-gelenkes." St. Petersburger Medicinisch-Wochenschrift, July 23, 1883.

³London Lancet, September, '87.

ease. But since in the sacro-iliac joint we are as yet unable to determine whether the local disease is a "granulation-mass" form, a wedge-shaped sequestrum form, or a primary tubercular synovitis, we are compelled to utilize as a prognostic symptom the fact that cold abscesses are or are not present. This fact, easily determined as a rule, gives also the chief indication for treatment.

For a reference to the table of cases in which abscesses did not occur, readily discloses the fact that sixteen out of the seventeen cases which were kept under observation till they terminated, resulted in recovery. The case that died was lost on account of an old hip-joint tuberculosis that completely obscured the disease of the sacro-iliac joint. This is 94 per cent of recoveries.

On the other hand, among thirty-eight cases in which abscesses occurred only three recovered without operation, that is, 7.9 per cent. The tendency of the disease is thus readily seen to be strongly unfavorable to life in the moist form; while in the form in which dry granulations persist throughout the course of the disease the prognosis is favorable. A natural division of therapeutic measures as well as an obvious classification for diagnostic and descriptive purposes follows from these facts.

For, if recoveries amount to 94 per cent. of all the cases in which no abscesses form, we certainly have reason to be satisfied with whatever measures of treatment have contributed to that result. And, since we know that cases in which the disease exhibited a dry form in the beginning may, at a later period, exhibit cold abscesses, we must adopt all possible means to prevent such a termination.